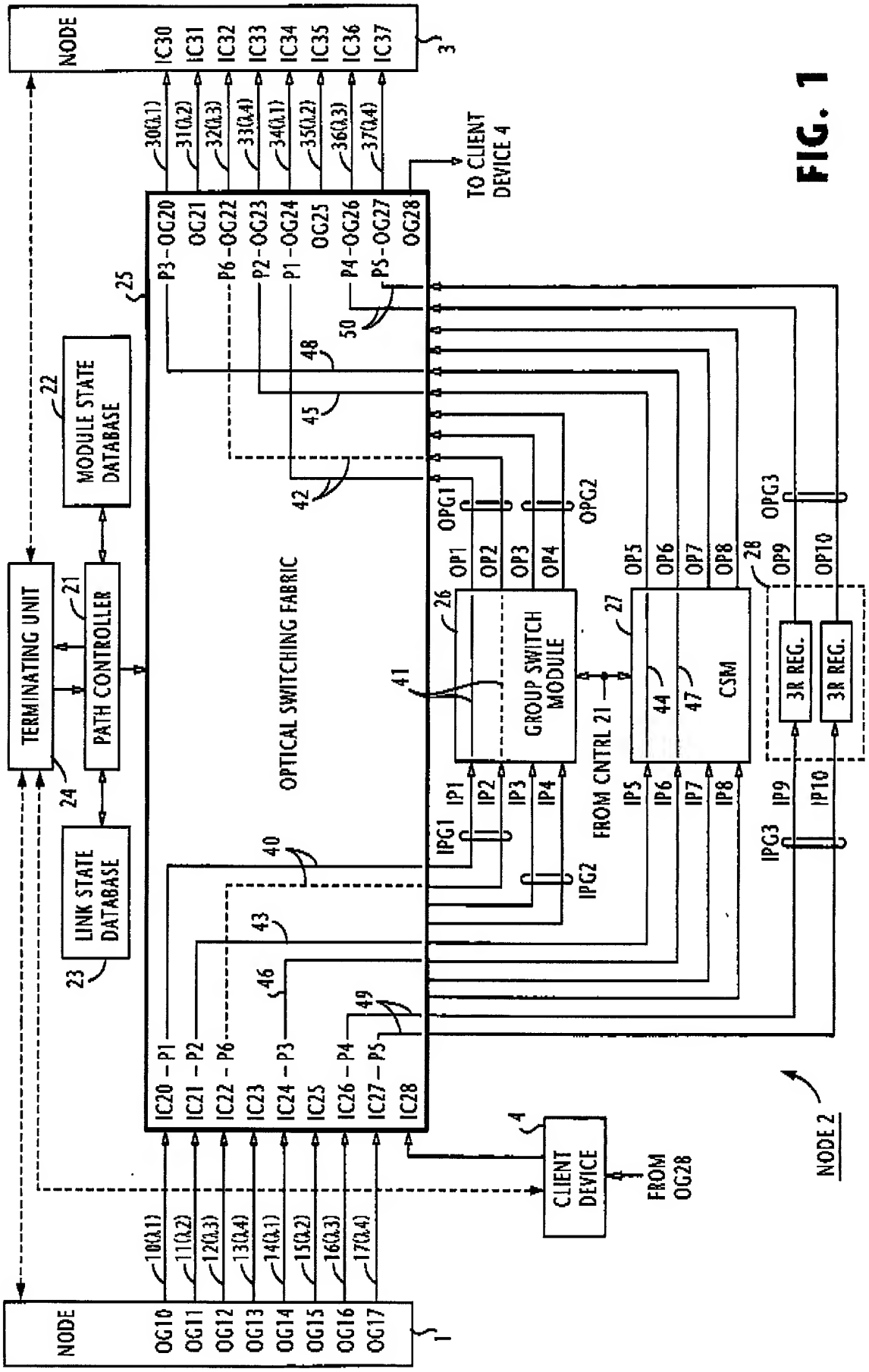
NODE
3
IC30
IC31
IC32
IC33
IC34
IC35
IC36
IC37
30(0,1)
31(0,2)
32(0,3)
33(0,4)
34(0,1)
35(0,2)
36(0,3)
37(0,4)
TO CLIENT DEVICE 4
25
P3-OG20
OG21
P6-OG22
P2-OG23
P1-OG24
OG25
P4-OG26
P5-OG27
OG28
50
48
45
42
MODULE STATE DATABASE
22
TERMINATING UNIT
21
PATH CONTROLLER
24
LINK STATE DATABASE
23
OPTICAL SWITCHING FABRIC
OPG1
OPG2
OPG3
OP1
OP2
OP3
OP4
OP5
OP6
OP7
OP8
OP9
OP10
26
27
28
41
GROUP SWITCH MODULE
CSM
3R REG.
3R REG.
44
47
FROM CNTRL 21
IPG1
IPG2
IPG3
IP1
IP2
IP3
IP4
IP5
IP6
IP7
IP8
IP9
IP10
40
43
46
49
IC20 – P1
IC21 – P2
IC22 – P6
IC23
IC24 – P3
IC25
IC26 – P4
IC27 – P5
IC28
4
CLIENT DEVICE
FROM OG28
NODE 2
NODE
1
OG10
OG11
OG12
OG13
OG14
OG15
OG16
OG17
10(0,1)
11(0,2)
12(0,3)
13(0,4)
14(0,1)
15(0,2)
16(0,3)
17(0,4)

FIG. 1

FIG. 2

MODULE STATE DATABASE

		ENTRY 1				ENTRY 2				ENTRY 3	
MODULE	MODULE NO.	GSM 26				CSM 27				GRM 28	
	MODULE TYPE	GROUP SWITCH				CHANNEL SWITCH				GROUP REG.	
	WVLN CONV.	UNAVAILABLE				AVAILABLE				UNAVAILABLE	
PATH NUMBER		P1	P6	—	—	P2	P3	—	—	P4	P5
INPUT PORT	PORT NO.	IP1	IP2	IP3	IP4	IP5	IP6	IP7	IP8	IP9	IP10
	PORT GRP NO.	IPG1		IPG2		—	—	—	—	IPG3	
	PORT COST	1	1	1	1	2	2	2	2	1	1
	AVAILABLE WAVELENGTH	ARB.	ARB.	—	—	λ2	λ1	—	—	λ2	λ4
	AVAILABLE DATA FORMAT	ARB.	ARB.	—	—	SONET	SONET	—	—	SONET	SONET
	MAX. DATA RATE (GBPS)	ARB.	ARB.	—	—	2.5	2.5	—	—	2.5	2.5
	INTERFACE NO.	IC20	IC22	—	—	IC21	IC24	—	—	IC26	IC27
OUTPUT PORT	PORT NO.	OP1	OP2	OP3/OP4		OP5	OP6	OP7/OP8		OP9	OP10
	PORT GRP NO.	OPG1		OPG2		—	—	—	—	OPG3	
	PORT COST	1	1	1	1	2	2	2	2	1	1
	AVAILABLE WAVELENGTH	DEP.	DEP.	—	—	ARB.	ARB.	—	—	λ2	λ4
	AVAILABLE DATA FORMAT	DEP.	DEP.	—	—	SONET	SONET	—	—	SONET	SONET
	MAX. DATA RATE (GBPS)	DEP.	DEP.	—	—	2.5	2.5	—	—	2.5	2.5
	INTERFACE NO.	OG24	OG22	—	—	OG23	OG20	—	—	OG26	OG27

LEGEND: ARB. = ARBITRARY

DEP. = DEPENDENT ON INPUT PORT WAVELENGTH, FORMAT AND RATE

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FIG. 3

LINK STATE DATABASE

FIELD	ENTRY 1	ENTRY 2	ENTRY 3	ENTRY 4	----------	ENTRY m
TRANSMIT NODE ADDRESS	NODE-1	NODE-1	NODE-1	NODE-1		
RECEIVE NODE ADDRESS	NODE-2	NODE-2	NODE-3	NODE-3		
OUTGOING IF NUMBER	OG10	OG12	OG10	OG12		
INCOMING IF NUMBER	IC20	IC22	IC30	IC32		
LINK COST	1	1				
CHANNEL COST			4	4		
WAVELENGTH	λ1	λ3				
INCOMING WAVELENGTH			λ1	λ3		
OUTGOING WAVELENGTH			λ1	λ3		
DATA FORMAT	SONET	SONET	SONET	SONET		
MAXIMUM DATA RATE	10 GBPS	10 GBPS	10 GBPS	10 GBPS		
PATH NUMBER	P1	P6	P1	P6		

FIG. 4

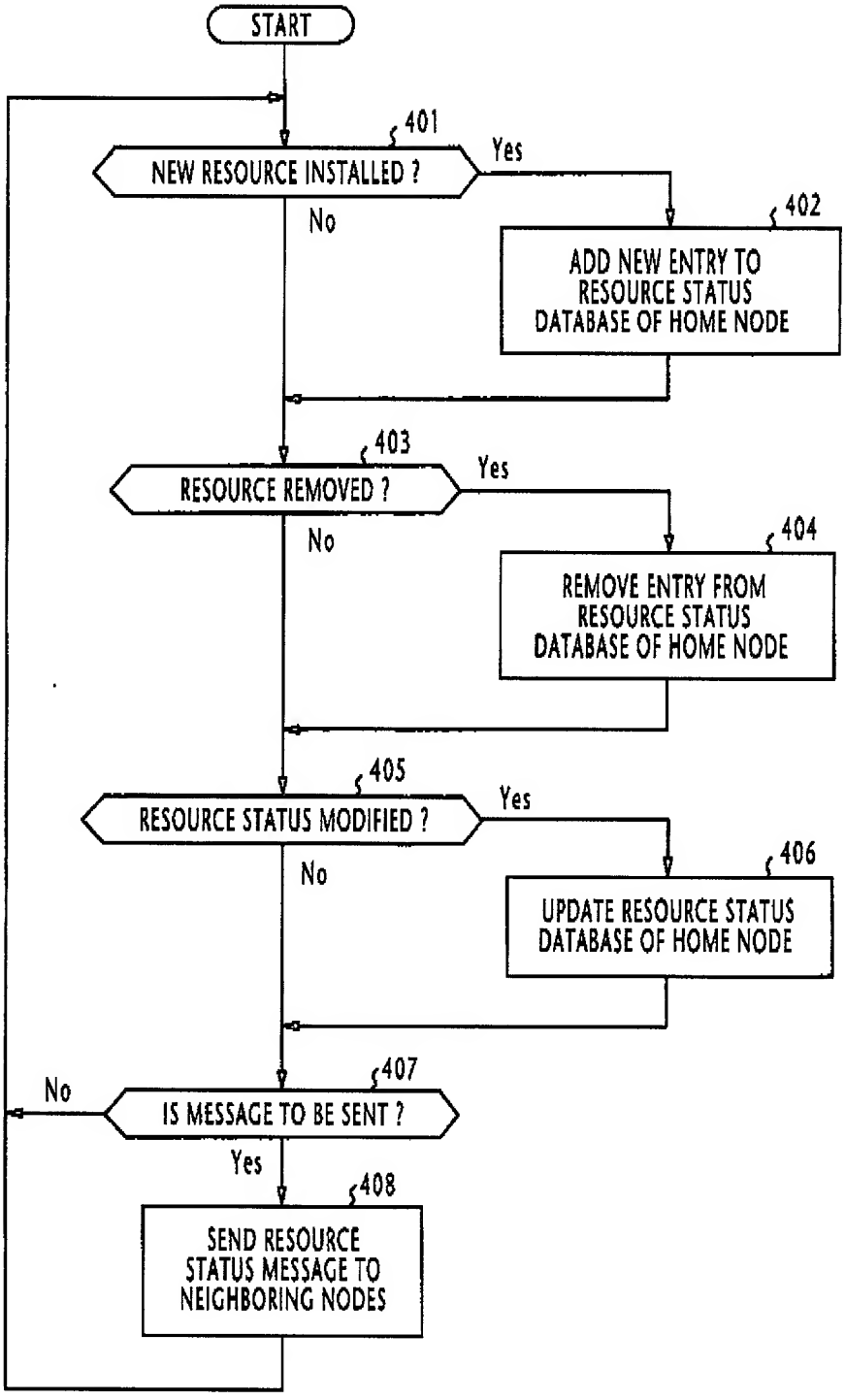

START
401
NEW RESOURCE INSTALLED ?
Yes
No
402
ADD NEW ENTRY TO RESOURCE STATUS DATABASE OF HOME NODE
403
RESOURCE REMOVED ?
Yes
No
404
REMOVE ENTRY FROM RESOURCE STATUS DATABASE OF HOME NODE
405
RESOURCE STATUS MODIFIED ?
Yes
No
406
UPDATE RESOURCE STATUS DATABASE OF HOME NODE
407
No
IS MESSAGE TO BE SENT ?
Yes
408
SEND RESOURCE STATUS MESSAGE TO NEIGHBORING NODES

FIG. 5

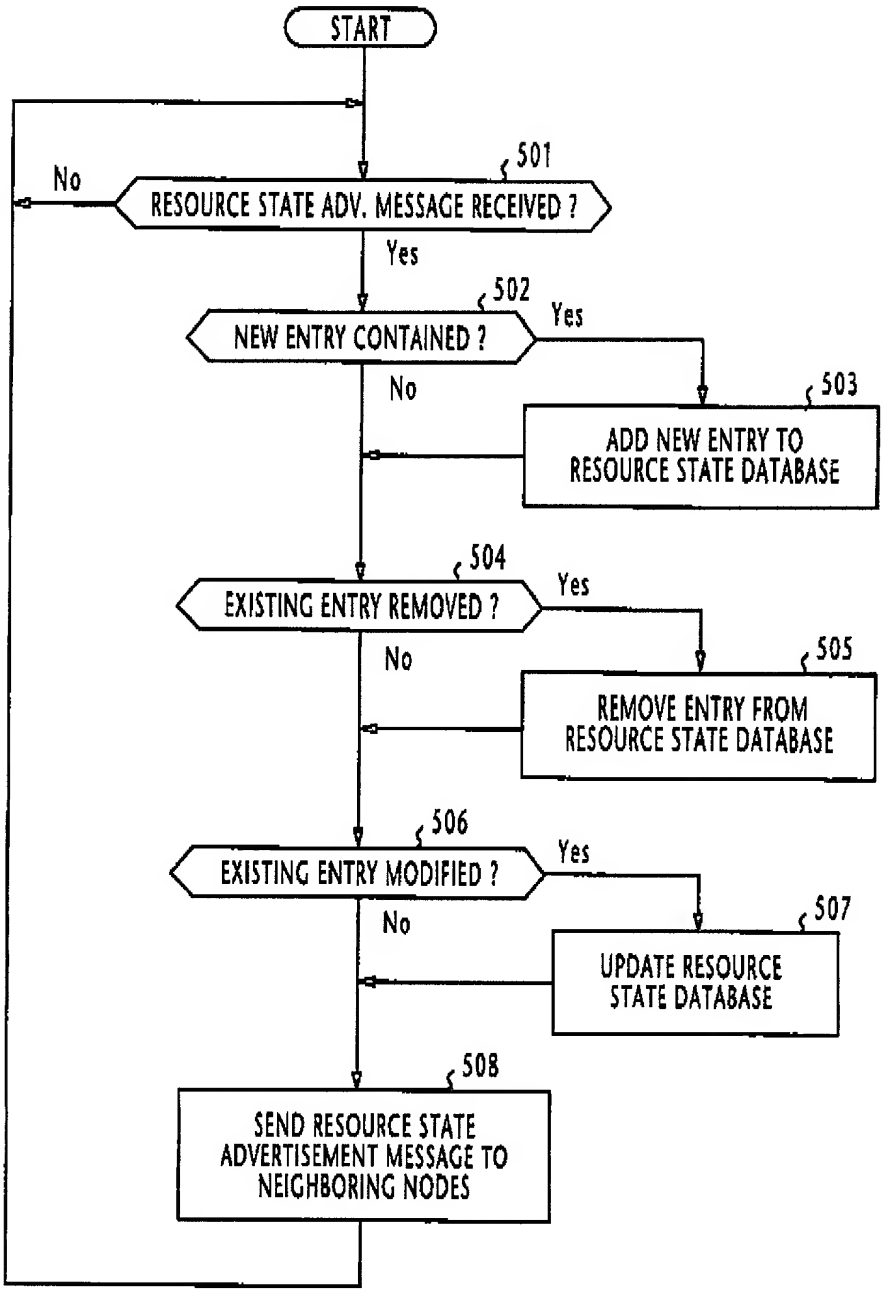
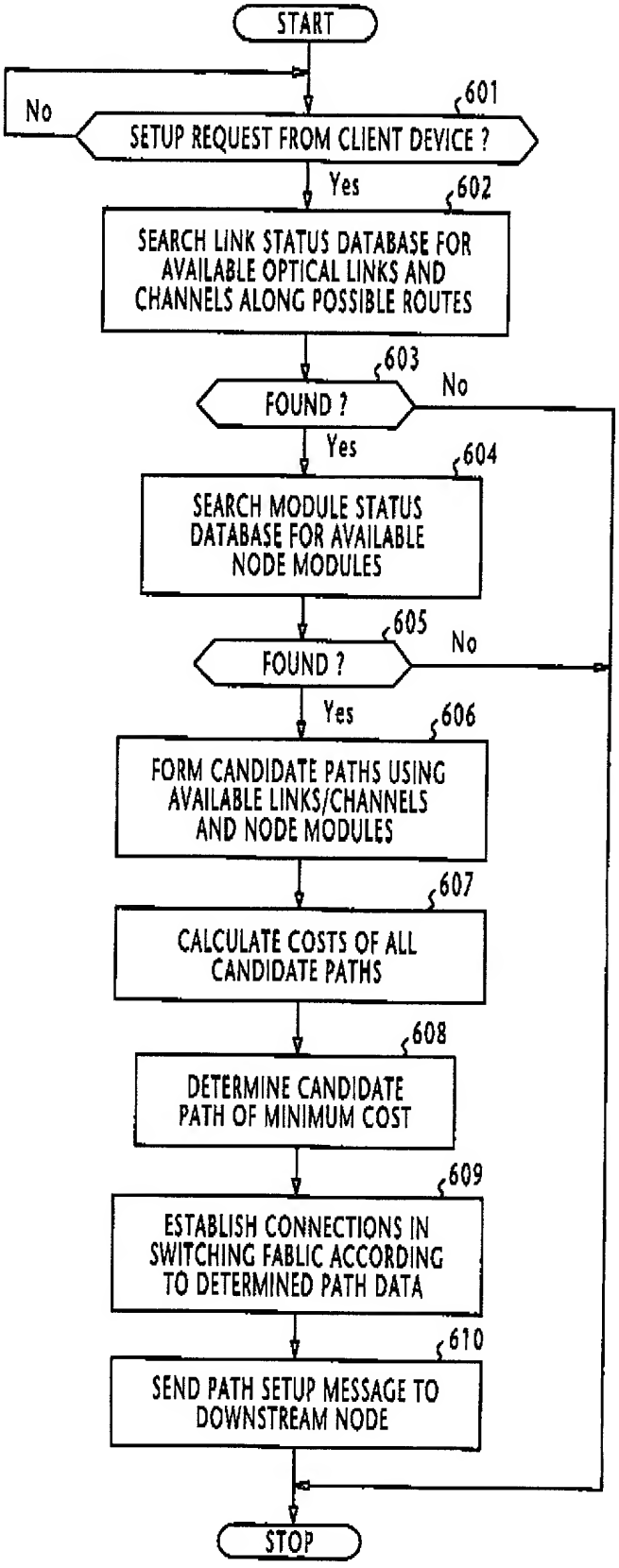

START
501
No
RESOURCE STATE ADV. MESSAGE RECEIVED ?
Yes
502
NEW ENTRY CONTAINED ?
Yes
No
503
ADD NEW ENTRY TO RESOURCE STATE DATABASE
504
EXISTING ENTRY REMOVED ?
Yes
No
505
REMOVE ENTRY FROM RESOURCE STATE DATABASE
506
EXISTING ENTRY MODIFIED ?
Yes
No
507
UPDATE RESOURCE STATE DATABASE
508
SEND RESOURCE STATE ADVERTISEMENT MESSAGE TO NEIGHBORING NODES

FIG. 6


START
No
601
SETUP REQUEST FROM CLIENT DEVICE ?
Yes
602
SEARCH LINK STATUS DATABASE FOR AVAILABLE OPTICAL LINKS AND CHANNELS ALONG POSSIBLE ROUTES
603
FOUND ?
No
Yes
604
SEARCH MODULE STATUS DATABASE FOR AVAILABLE NODE MODULES
605
FOUND ?
No
Yes
606
FORM CANDIDATE PATHS USING AVAILABLE LINKS/CHANNELS AND NODE MODULES
607
CALCULATE COSTS OF ALL CANDIDATE PATHS
608
DETERMINE CANDIDATE PATH OF MINIMUM COST
609
ESTABLISH CONNECTIONS IN SWITCHING FABLIC ACCORDING TO DETERMINED PATH DATA
610
SEND PATH SETUP MESSAGE TO DOWNSTREAM NODE
STOP

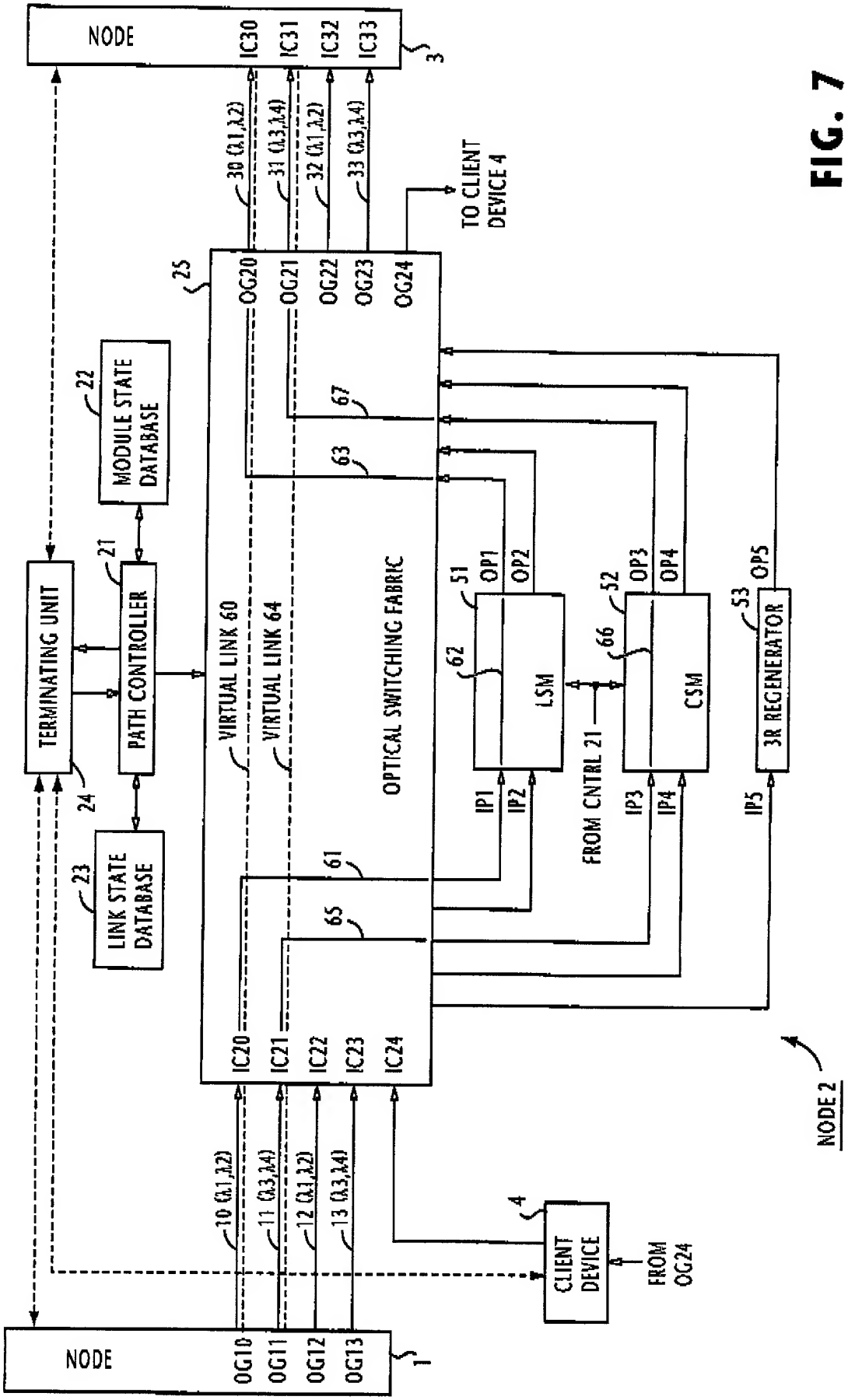

NODE
IC30
IC31
IC32
IC33
3
30 (λ1,λ2)
31 (λ3,λ4)
32 (λ1,λ2)
33 (λ3,λ4)
TO CLIENT DEVICE 4
25
OG20
OG21
OG22
OG23
OG24
22
MODULE STATE DATABASE
67
63
TERMINATING UNIT
21
PATH CONTROLLER
VIRTUAL LINK 60
VIRTUAL LINK 64
OPTICAL SWITCHING FABRIC
51
OP1
OP2
52
OP3
OP4
53
OP5
62
LSM
66
CSM
3R REGENERATOR
24
23
LINK STATE DATABASE
61
65
IP1
IP2
FROM CNTRL 21
IP3
IP4
IP5
IC20
IC21
IC22
IC23
IC24
NODE 2
10 (λ1,λ2)
11 (λ3,λ4)
12 (λ1,λ2)
13 (λ3,λ4)
4
CLIENT DEVICE
FROM OG24
NODE
OG10
OG11
OG12
OG13
1

FIG. 7

FIG. 8

MODULE STATE DATABASE

		ENTRY 1				ENTRY 2		ENTRY 3
MODULE	MODULE NO.	LSM 51				CSM 52		CRM 53
	MODULE TYPE	GROUP SWITCH				CHANNEL SWITCH		CHANNEL REG.
	WVLN CONV.	UNAVAILABLE				AVAILABLE		UNAVAILABLE
PATH NUMBER		P1	P2	P3	P4	P5	P6	
INPUT PORT	PORT NO.	IP1				IP3		
	PORT COST	1				2		
	AVAILABLE WAVELENGTH	λ1, λ2				λ3		
	AVAILABLE DATA FORMAT	SONET				SONET		
	MAX. DATA RATE (GBPS)	2.5				2.5		
	INTERFACE NO.	IC20				IC21		
OUTPUT PORT	PORT NO.	OP1				OP3		
	PORT COST	1				2		
	AVAILABLE WAVELENGTH	λ1, λ2				λ3		
	AVAILABLE DATA FORMAT	SONET				SONET		
	MAX. DATA RATE (GBPS)	2.5				2.5		
	INTERFACE NO.	OG20				OG21		

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FIG. 9

LINK STATE DATABASE

FIELD		ENTRY 1	ENTRY 2	ENTRY 3	ENTRY 4	ENTRY 5	ENTRY 6	------	ENTRY n
OUTGOING NODE ADDRESS		NODE-1	NODE-2	NODE-1	NODE-2	NODE-1	NODE-1	------	
INCOMING NODE ADDRESS		NODE-2	NODE-3	NODE-2	NODE-3	NODE-3	NODE-3	------	
OUTGOING IF NUMBER		OG10	OG20	OG11	OG21	OG10	OG11	------	
INCOMING IF NUMBER		IC20	IC30	IC21	IC31	IC30	IC31	------	
CHANNEL 1	CHANNEL NUMBER	#1	#1	#1	#1	#1	#1		
	CHANNEL COST	1	1	1	1	3	4	------	
	WAVELENGTH	λ1	λ1	λ3	λ3	λ1	λ3	------	
	DATA FORMAT	SONET	SONET	SONET	SONET	SONET	SONET	------	
	MAXIMUM DATA RATE	2.5	2.5	2.5	2.5	2.5	2.5	------	
	PATH NUMBER	P1	P1	P5	P5	P1	P5	------	
CHANNEL 2	CHANNEL NUMBER	#2	#2			#2		------	
	CHANNEL COST	1	1			3		------	
	WAVELENGTH	λ2	λ2			λ2		------	
	DATA FORMAT	SONET	SONET			SONET		------	
	MAXIMUM DATA RATE	2.5	2.5			2.5		------	
	PATH NUMBER	P2	P2			P2		------	

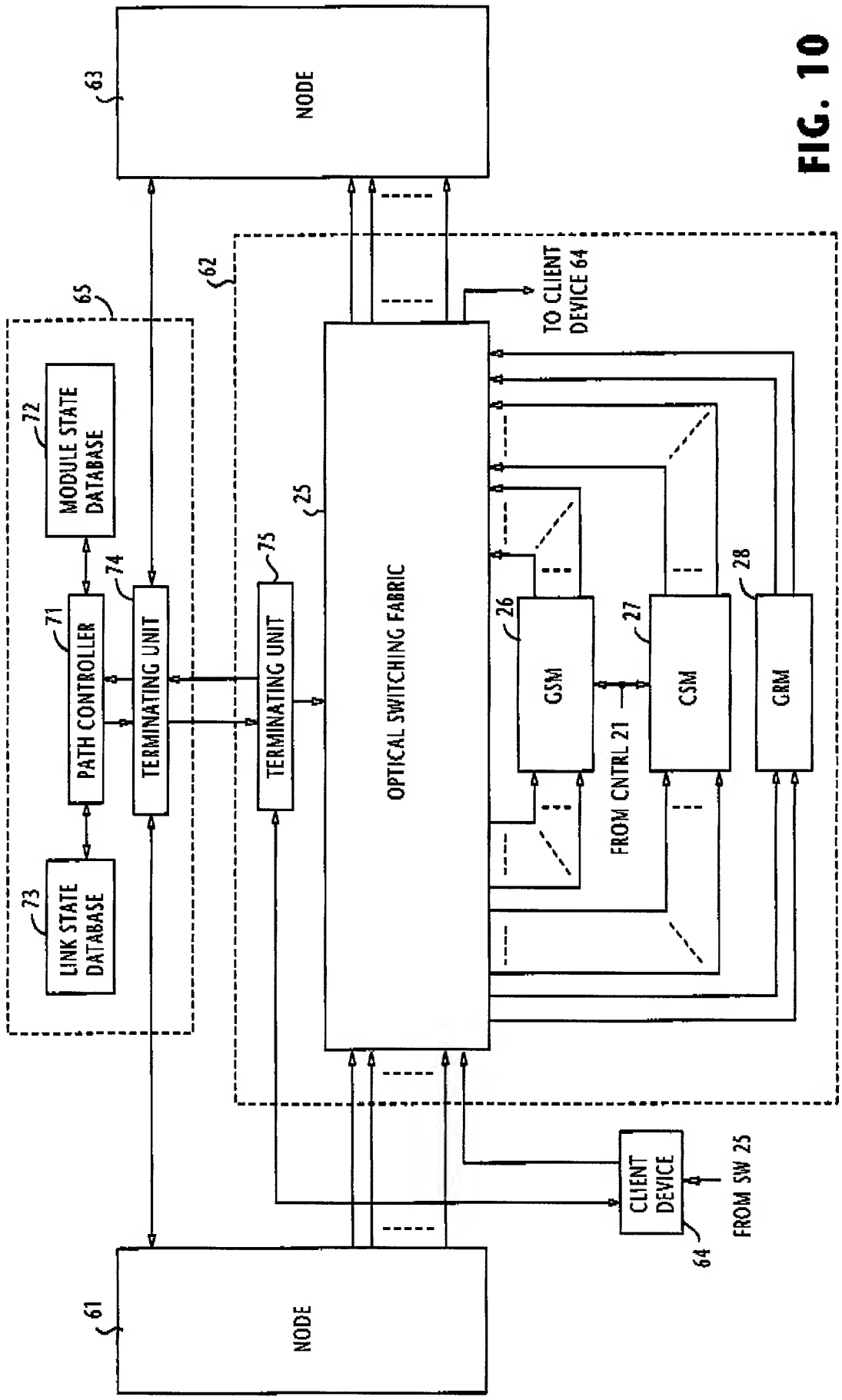
NODE
63
62
65
TO CLIENT DEVICE 64
MODULE STATE DATABASE
72
OPTICAL SWITCHING FABRIC
25
75
74
71
PATH CONTROLLER
TERMINATING UNIT
TERMINATING UNIT
26
GSM
27
CSM
28
GRM
FROM CNTRL 21
LINK STATE DATABASE
73
CLIENT DEVICE
64
FROM SW 25
NODE
61

FIG. 10